

Appl. No. 10/683,603
Reply to Office Action of August 14, 2006

Atty. Dkt. No.:
UCF-269DIV

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claims 1 – 14 (Cancelled).

Claim 15 (Withdrawn). An apparatus for sustainable CO₂-free production of hydrogen and carbon via continuous thermocatalytic decomposition of hydrocarbons over carbon-based catalyst in air and/or water-free environment, employing continuous reactivation of the catalyst, comprising the combination of:

- (a) a thermocatalytic reactor with a stream having a moving bed of carbon particulates;
- (b) means for recovering hydrogen-containing gas from said reactor;
- (c) means for recovering pure hydrogen from said stream;
- (d) means for recycling at least a portion of hydrogen-depleted gas to said reactor;
- (e) means for disintegration of carbon particles after said reactor; and
- (f) means for heating of carbon particles.

Claim 16 (Withdrawn). The apparatus of claim 15, where the moving bed reactor is a fluidized bed reactor.

Claim 17 (Withdrawn). The apparatus of claim 15, where the carbon-based catalyst is carbon black.

Claim 18 (Withdrawn). The apparatus of claim 15, where the means of recovering pure hydrogen is a membrane gas separation unit.

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Claim 19 (Withdrawn). The apparatus of claim 15, where the means of disintegration is a grinder.

Claim 20 (Cancelled).

Claim 21 (Currently Amended). An apparatus for generating electricity and sustainable CO₂-free production of hydrogen and carbon via continuous thermocatalytic decomposition of hydrocarbons over carbon-based catalyst in air and/or water-free environment, employing continuous reactivation of the catalyst, comprising the combination of:

- (a) a thermocatalytic reactor with a moving bed of carbon particulates;
- (b) means for purging the moving bed of carbon particulates of moisture and air;
- (b)-(c) means for recovering hydrogen-containing gas from said the reactor;
- (d) means for separating the hydrogen-containing gas of step (c) into a first portion of pure hydrogen and a second portion of hydrogen-depleted gas;
- (e) (e) means for recycling at least a portion of hydrogen-depleted gas to said the reactor to sustain high catalytic activity of the carbon catalyst in-situ;
- (d) (f) means for recovering disintegration of carbon particles after said from the reactor;
- and
- (g) means for disintegration of carbon particles of step (f);
- (e) (h) means for heating of carbon particles to provide externally activated catalyst that is recycled to the reactor;

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(f) (i) means for recovering pure hydrogen from ~~said~~ the stream; and

(g) (i) means for transporting ~~said~~ the pure hydrogen into anode of a fuel cell, whereby electricity is generated.

Claim 22 (Currently Amended). The apparatus of claim 21, where the thermocatalytic reactor with a moving bed of carbon particulates ~~reactor~~ is a fluidized bed reactor.

Claim 23 (Original). The apparatus of claim 21, where the carbon particulate is carbon black.

Claim 24 (Currently Amended). The apparatus of claim 15, where the means of for recovering pure hydrogen is a membrane gas separation unit.

Claim 25 (Currently Amended). The apparatus of claim 21, where the means of for disintegration is a grinder.

Claim 26 (Currently Amended). The apparatus of claim 21, where the means of transporting fuel cell for and generating electricity is a polymer electrolyte membrane fuel cell.